Pelvic Exenteration

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Pelvic exenteration offers the only possibility for cure in patients who have pelvic recurrence after receiving optimum amounts of irradiation. With improved radiotherapy techniques, the number of patients with isolated central failure is steadily diminishing, but there remains a significant number of patients with recurrent cancer of the cervix after radiation therapy for whom the procedure offers the only chance for life. Each patient must be assessed individually, with the risks of the procedure weighed against the possible benefits. Technical advances continue to reduce the operative mortality and ameliorate the postoperative morbidity associated with pelvic exenteration.

EXTENDED OR ULTRA-RADICAL SURGICAL OPERATION in the treatment of advanced and recurrent pelvic cancer is an American invention made possible by advances in the ancillary sciences which support the surgical team. The natural history of many pelvic cancers is such that they may be locally advanced but still limited to the pelvis. Thus, unlike most other malignant lesions, they lend themselves to radical resection. Brunschwig[1] in 1948 introduced the operation of pelvic exenteration or cancer of the cervix. Since that time an extensive experience with pelvic exenteration has

been accumulated and the techniques as well as patient selection have steadily improved so that now, 25 years later, this procedure has attained an important role in the treatment of gynecologic malignant disease. Pelvic exenterative operation, severely criticized at first, is now accepted as a respectable procedure that can offer life to selected patients when no other possibility of cure exists. The criticism of this procedure has been lessened by the steadily improving mortality and morbidity rates and the gratifying five-year survival record. Most important, however, it has been shown that patients who survive this procedure can be rehabilitated to a useful and healthful existence.

Although pelvic exenteration has been used for a variety of pelvic malignant lesions, its greatest and most important role is in the treatment of
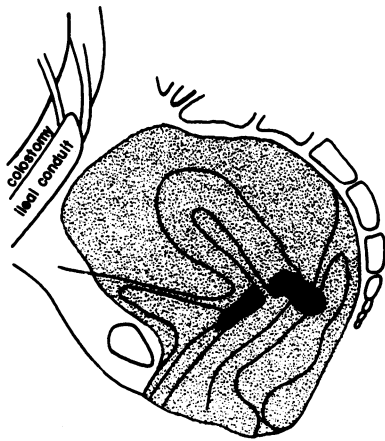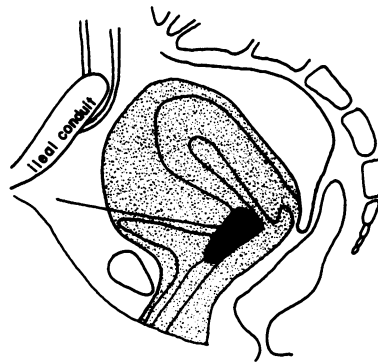
Figure 1.—Total exenteration with removal of pelvic viscera including bladder and rectosigmoid flexure.

Figure 2.—In selected cases the procedure may be limited to anterior exenteration with the removal of bladder and preservation of the rectosigmoid flexure.
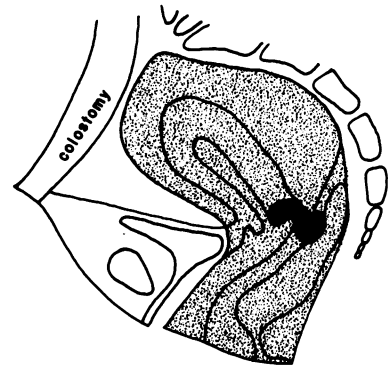
Figure 3.—Posterior exenteration, also for selected cases, with the rectosigmoid flexure removed and the bladder preserved.

advanced or recurrent carcinoma of the cervix. Total exenteration with removal of the pelvic viscera, including the bladder and rectosigmoid flexure, is the procedure of choice for carcinoma of the cervix recurrent or persistent within the pelvis after irradiation (Figure 1). In very selected cases the procedure may be limited to either an anterior exenteration with removal of the bladder and preservation of the rectosigmoid flexure (Figure 2); or posterior exenteration with removal of the rectosigmoid flexure and preservation of the bladder (Figure 3). Cogent objections have been raised regarding these limited operations, especially in patients with carcinoma of the cervix recurrent after irradiation, because of the increased risk of an incomplete resection. In addition, patients in whom the bladder or rectum is preserved often are victims of multiple complications and malfunctioning of the preserved organ. Consequently, some surgeons have abandoned subtotal exenteration.

One of the greatest technical advances in the evolution of pelvic exenteration is the intestinal conduit for diversion of the urinary stream. Originally Brunschwig transplanted the ureters into the left colon just proximal to the site of colostomy, creating the so-called "wet colostomy." The complication rate from this procedure, especially electrolyte imbalance and severe urinary tract infections, was unacceptable. We are indebted to Bricker[2] for popularizing the use of and ileal segment conduit for urinary diversion. The incidence of both postoperative pyelonephritis and hypochloremic acidosis has been greatly reduced. Fur-

thermore, the patients are dry and comfortable and, therefore, more easily rehabilitated. More recently, a segment of sigmoid colon rather than small bowel has been utilized by some surgeons in selected cases as a urinary conduit. This technique offers the additional advantage of avoiding small bowel anastamosis and the threat of fistula formation attending it.

Patient Selection

Only a small portion of the patients with recurrent cancer of the cervix are suitable for this operation. Metastatic extension outside the pelvis, whether manifest before operation or discovered at laparotomy is an absolute contraindication to pelvic exenteration. The triad of homolateral leg edema, sciatic pain and ureteral obstruction is pathognomonic of recurrent and unresectable disease in the pelvis.[3] The triad must be complete, however, to be entirely reliable. Weight loss, cough, anemia and other aberrations suggestive of advanced disease are not sufficient justification of themselves to discontinue efforts toward surgical management. Obesity, advanced age and systemic diseases may interdict extensive operation, in direct relation to the severity of these factors. Some patients are unsuitable for psychiatric reasons and a number of women, otherwise candidates for pelvic exenteration, decide to accept the risk of recurrence without resection.

While the pelvic examination plays a key role in the preoperative assessment of individual pa-

tients, the examiner's impression of resectability must be tempered by the knowledge that errors are common. A small central lesion with freely mobile parametria reliably demonstrates resectability; however, immobility can be due to radiation fibrosis or to pelvic inflammatory disease (old salpingitis, inflammation from uterine perforation and the like). Consequently, even when the disease seems inoperable on pelvic examination, if other factors are favorable one should proceed with the investigation and exploratory laparotomy to avoid the error of a premature decision. Obviously in many cases the finest clinical judgment must be used to avoid rejecting a potentially curable patient, and also to prevent as often as possible subjecting an unsuitable patient to the rigors, fears and false hopes of prolonged preparation for a fruitless operation.

Evaluation studies before operation include chest x-ray studies, an intravenous pyelogram, creatinine determination, liver function tests and an assessment of the patient's hemostatic mechanism. Bilateral lower extremity lymphography has been useful in the experience of some surgeons. Bone survey and liver scan are not part of the "routine" evaluation. A blind scalene node biopsy has been advocated by Ketcham[4] and, if positive, would be a contraindication to further operation.

At laparotomy the entire abdomen and pelvis are explored for evidence of metastatic and intraperitoneal cancer. The lymph nodes around the lower aorta become the first area of sampling if the exploration of the abdomen has revealed no evidence of disease. The patient probably has had a lymphangiogram before laparotomy, which is helpful in directing the surgeon to suspicious nodes in the para-aortic and pelvic area. If the lower aortic area is negative, bilateral pelvic lymphadenectomy is performed. There have been virtually no surivivors among patients who have undergone pelvic exenteration with multiple positive pelvic wall nodes. Therefore, immediate frozen section analysis of the pelvic wall nodes is necessary in order to determine whether the resection should continue.

In Ketcham's[5] series of approximately 200 patients undergoing pelvic exenteration, only one who had a positive pelvic lymph node after irradiation therapy survived five years. In the series from Memorial Hospital for Cancer and Allied Diseases, New York City, reported by Barber,[6] 148 patients in whom radiation had failed had positive nodes at the time of exenteration, and

only four of these patients survived five years. Most survivors with positive nodes had only microscopic disease in the nodes. Furthermore, in nearly every case reported in the literature of survivorship following exenteration for recurrent squamous cell carcinoma of the cervix in which there was a positive pelvic node, the nodal disease was not only microscopic but unilateral.

The pelvic lymphadenectomy having been completed, attention is turned to the status of the web or cardinal ligaments. The paravesical and pararectal spaces are developed and a critical assessment of the proximity of the central malignant disease to the pelvic wall is made. If there is a tumor-free space between the lesion and the pelvic wall, then resection probably is feasible. One must be cautious to analyze the entire web, especially the area immediately above the levator ani muscles. Often the most superior portion of the web will be free and then the surgeon will find dense adherence of the tumor to the pelvic wall inferiorly at the level of the levators. If removal of lymph nodes has shown no metastatic disease, it is at this point that the final decision is made as to whether or not exenteration is possible. Pelvic exenteration is not considered a satisfactory means of intentional palliation; the only established goal of this operation is complete cure.

Strenuous efforts have been made to decrease the permanent morbidity and increase patient acceptability of pelvic exenteration by tailoring the procedure to the known extent of the patient's disease. While it is rarely justifiable to salvage the bladder, because of its natural anatomic association with the cervix, the rectosigmoid flexure may occasionally be preserved and at times it is feasible to do a lower segmental resection of the rectum and then carry out re-anastamosis. A temporary diverting colostomy must always be done in conjunction with this maneuver. In most patients the possibility of constructing a vagina from a split thickness skin graft at the time of initial operation should also be considered. With these modifications, exenteration for pelvic malignant disease can frequently be performed, leaving the patient with but one stoma and a functional vagina.

Morbidity and Mortality

The morbidity and mortality directly related to exenteration occur within the first 18 months following the procedure. Many of the complications seen could be the sequel to any form of major operation. These include cardiopulmonary catas-

trophes such as pulmonary embolism, pulmonary edema, myocardial infarction, and cerebral vascular accidents. The length of these surgical procedures and the magnitude of blood loss definitely increase the incidence of cardiovascular complications. This category of complications usually occurs within the first week following the procedure. Then follows a period in which sepsis is the greatest threat to the patient's health and life. This sepsis usually has its origin in the pelvic cavity with the occurrence of a pelvic abscess or, more commonly, diffuse pelvic cellulitis.

One of the most serious complications following exenteration is small bowel obstruction related to the denuded pelvic floor. In the last decade several techniques have been utilized in an effort to avoid the adherence of small bowel to this large raw surface, including mobilization of omentum or abdominal wall peritoneum to cover the pelvic floor. When small bowel obstruction does occur, it is appropriately treated with conservative therapy. However, half of these patients come to re-operation and the mortality in this group approaches 50 percent. The risk of bowel obstruction is multiplied by pelvic infection and both conditions predispose to the development of small bowel fistulas, which always require re-operation and frequently augur a fatal outcome.

Complications in general are far more common in patients who have recurrence after irradiation therapy. Irradiated tissue is less likely to give good wound healing, and the formation of granulation tissue is severely retarded. The tendency for fistula formation is decidedly increased. Since surgical dissection after irradiation is usually more difficult, operating time and blood loss often are increased. Both of these factors are associated with higher morbidity and mortality. The long-term morbidity from exenteration centers mostly about complications related to urinary diversion. Once the period of susceptibility to sepsis has passed,

urinary obstruction and infection become the major non-neoplastic life-threatening complications. Recurrent cancer is always the most likely long-term, life-threatening situation following the operative procedure, but the more preventable complications of the ileal conduit deserve primary attention. Long continued urinary antisepsis, perhaps for life, is advisable after exenteration. Pyelonephyritis is common and should be treated promptly and vigorously. Intravenous pyelography must be carried out periodically to assess the collecting system for hydronephrosis. A mild degree of obstruction is frequently retained following construction of an ileal conduit, but progressive hydronephrosis will require correction to salvage renal function. Death from remedial renal disease when there is no residual carcinoma is doubly tragic.

The morbidity and mortality from radical operation can be minimized by careful selection of patients; but the selection should not be so stringent as to deny resection in borderline cases for the outcome of recurrent carcinoma of the cervix without further treatment is clear.

Survival Results

The reported five-year cumulative survival after pelvic exenteration varies from 25 percent to 40 percent (Table 1). Reported survival rates depend on the circumstances of patient selection for exenteration. For example, where exenteration is a primary procedure the five-year survival rate is close to 50 percent. (Pelvic exenteration might be done as a primary procedure for carcinoma of the vulva extending up the vagina and into the rectum or bladder, and carcinoma of the cervix with extension into the bladder but not out to the pelvic sidewalls.) In contrast, the five-year survival associated with exenteration after full irradiation therapy for cervical carcinoma is much less than 50 percent in most series. Excluding the

TABLE 1.—	Author	Institution	Number of Patients Treated	Number of Operative Deaths	Number Surviving 5 Years
Reported Five-year Survival Rates after Pelvic Exenteration	KREIGER, J.[7] (1969)	Cleveland Clinics	35	4	13
	BRICKER, E.[8] (1967)	Washington University	153	15	53
	KETCHAM, A.S.[5] (1970)	NCI	162	12	62
	SYMMONDS, R.[9] (1968)	Mayo Clinic	54	14	14
	DOUGLAS, R.[10] (1957)	New York Hospital	23	1	5
	PARSONS, L.[11] (1964)	Boston	112	24	24
	RUTLEDGE, F.[12] (1965)	M. D. Anderson	108	18	31
	BRUNSCHWIG, A.[13] (1965)	Memorial Hospital	535	86	108
	TOTAL		1182	174 (15%)	310 (26%)

elderly, the obese, the heavily irradiated and other high risk patients would of course affect survival rates. Withholding exenteration if there is a positive pelvic node following pelvic irradiation also improves cumulative survival rates. In general, however, both the morbidity and mortality rates and the five-year survival rate have steadily improved over the last decade. Mortality rates in most centers are now well below 10 percent and morbidity rates are similarly lowered.

The outcome for many patients is related to certain preoperative findings. In the series from M. D. Anderson Hospital, 47 percent of the patients who had symptoms (pain or edema) with their recurrence but were found at operation to have resectable lesions, survived two years, whereas 73 percent of the patients who were symptom-free at the time of laparotomy survived two years. Of the patients who had a normal intravenous pyelogram at the time of laparotomy, 59 percent survived two years, while only 34 percent of the patients in whom the pyelogram showed some abnormality survived that long. In the group who had recurrence within two years of the primary treatment, 46 percent survived two years; if recurrence did not happen until five years or more after treatment, 61 percent survived two years. Therefore such factors as pyelographic findings, the presence or absence of symptoms and the interval between primary treatment and recurrence should be considered in the preoperative assessment of the patient, but here again they should not be so weighted as to forego the chance for cure in patients with resectable lesions.

In order for the mortality and morbidity to be acceptable, the operation should be done in medical centers by experienced surgical teams knowledgeable in the multi-disciplinary approach to cancer therapy who can tailor the management to each patient's needs. These ultra-radical procedures should be done only by surgeons with adequate training and background who are willing to take on the responsibility of long-term postoperative care and rehabilitation.

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